

Shaped body, in particular for a seat cushion

The invention relates to a shaped body, in particular for a seat cushion.

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The invention is based on the object of designing a shaped body of this type in such a manner that it can be used, in particular, for a seat cushion and results here in high seating comfort with an overall height which is reduced in comparison to conventional seat cushions and which can be used in general for the sphere of seating furniture (armrests, back cushions, neck cushions) and, in particular, also for the vehicle sector, in which a reduction in the overall height is particularly advantageous, since this enables a higher installation space to be provided under the vehicle seat for technical internal components.

20 According to the invention, this object is achieved in its most general form by a shaped body having the features of claim 1.

In this case, it is expedient if the supports are at a narrower distance from one another in the region of the pressure peaks which occur under load, it preferably being possible for the supports to be of columnar design.

30 For ventilation purposes, it is advantageous if the upper covering is a spacer knit which consists of two textile surfaces connected to each other by spacer threads. The spacer knit, which is known per se, is composed of a fabric base, a fabric side and of connecting bars connecting them to each other. The properties of a spacer knit are substantially influenced by the binding structures, i.e. the binding of the threads into the surface, the mesh density and the mesh strength. Owing to their 3D structure, spacer knits provide many technical advantages, such as air

permeability, low weight, good restoring behavior, shock absorption, circulation of heat, recycleability, purity of quality and good deformability.

- 5 Reference is made to the subject matters of claims 6 to 10 in respect of special embodiments of the polyurethane foam layer and its connection to the gel layer.
- 10 According to the invention, the gel layer consists of a polyurethane gel, the chemical structure of which can consist of long polymer threads and only a few linkages without added plasticizers being used.
- 15 However, it is possible for an undercrosslinked polyurethane based on polyols and polyisocyanates or polyethers and polyisocyanates to be used for the gel.

According to the invention, it is expedient if the gel
20 compounds are produced using starting materials having an isocyanate functionality of the polyol component of at least 5.2, preferably of at least 6.5, in particular of at least 7.5.

25 In this case, it is advantageous if the polyol component for producing the gel consists of a mixture of

- a) one or more polyols having hydroxyl numbers under
30 112, and
b) one or more polyols having hydroxyl numbers in the range of from 112 to 600,

the weight ratio of component a) to component b) being
35 between 90:10 and 10:90, the characteristic isocyanate number of the reaction mixture being in the range of 15 to 60, and the product from the isocyanate functionality and functionality of the polyol component being at least 6.

As an alternative solution, it can be provided that the polyol component for producing the gel consists of one or more polyols having a molecular weight of between 1000 and 12 000 and an OH number of between 20 and 112, the product of the functionalities of the polyurethane-forming components being at least 5 and the characteristic isocyanate number being between 15 and 60.

Finally, it is advantageous if the isocyanates used for the production of the gels are those of the formula Q (NCO) in which N is 2 to 4 and Q is an aliphatic hydrocarbon radical having 8 to 18 C atoms, a cycloaliphatic hydrocarbon radical having 4 to 15 C atoms, an aromatic hydrocarbon radical having 6 to 15 C atoms or an araliphatic hydrocarbon radical having 8 to 15 C atoms, and if the polyurethane is produced with isocyanates in a pure form or with urethanized, allophanisized, biurethisized or functionally correspondingly modified isocyanates.

Patent EP 57 838 claims gels for avoiding decubitus, which are characterized by a low characteristic number, i.e. by "undercrosslinking". They are produced by reaction of a polyisocyanate with long-chain polyols which are to be free of short-chain components. These dimensionally stable gels from polyurethane starting materials can be used as mattresses, mattress inserts, car seats and as padding material. The patent EP 511 570 discloses improved gels consisting of polyols and isocyanates with low characteristic numbers which are produced from mixtures of long-chain and short-chain polyethers. The polyol and polyisocyanate mixtures which can be produced more favorably in terms of processing technology are preferably used as padding material in the shoe industry, as coverings for avoiding or preventing injuries, for face masks, as paddings of horses' saddles and in other applications.

For the applications mentioned above by way of example, the known polyol and isocyanate mixtures consistently have the disadvantage of the high dead weight and the high heat capacity which is associated therewith. The high dead weight of approximately 1.0 g/cm^3 means that the use is restricted to applications in which the weight plays a secondary role in relation to the excellent pressure-distributing properties. Moreover, the high-heat capacity of the polyurethane gel may be perceived as being unpleasant when in direct body contact, since body heat is taken from the body in a clearly noticeable manner to heat up the particular gel compounds.

Patent DE 43 08 445 A1 mentions various processes and patent specifications (EP-B 0 057 839; WO-88/01878; EP 0 453 286) for producing gel foams with air, nitrogen and carbon dioxide. The reduction in the specific weight and the associated reduction in the heat capacity are achieved to the desired extent, but the gels have the disadvantage that the cells which are formed when subjected to a compressive stress bond to the inner walls of the cells due to the very high self-adhesive behavior of the reaction products which are always undercrosslinked and are based on polyols and polyisocyanates. Moreover, the cells constitute a weakening of the gel matrix which has a negative effect on the mechanical properties, such as elongation at break and tensile strength. The cellular gel also returns more slowly into its starting position after having been subjected to a load. Furthermore, shrinkage problems, as are known from processing polyurethane foams, may occur.

A further disadvantage of the polyurethane gels described is the behavior when sat on. A gel cushion is frequently perceived as being hard, in particular on first contact, because the gel does not flow or has not

flowed into the desired position guaranteeing optimum distribution of pressure until after a time delay.

5 A gel compound which makes possible a significant reduction in the weight and the heat capacity and a significant improvement in the comfort when sat on while retaining the typical gel properties, for example, the absorption of shearing forces, signifies a significant technical improvement.

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The gel compounds which are to be used for the gel layer provided according to the invention are intended to avoid the abovementioned disadvantages and are intended to join the typical advantageous gel
15 properties with a low specific weight, an overall lower heat conducting capacity and good durability and properties concerning the pattern of use which remain uniform over the long term. It is therefore advantageous if the gel layer contains elastic hollow
20 microbeads as filler, the hollow microbeads consisting of polymeric material, preferably polyolefin, and being coated with a covering layer of an inorganic material, preferably calcium carbonate.

25 It is advantageous if the hollow microbeads have a diameter of 10 μm to 150 μm , and if the content of hollow microbeads in the gel material is 0.1 to 10% by weight.

30 The seating comfort can be overall further improved by coarse-grained solid particles which consist of small pieces of cork, cork powder, small pieces of wood, wood shavings, foam flakes, styropor, textile fibers or textile pieces, the diameter of which solid particles
35 is preferably between 0.1 mm and 15 mm, being distributed in the gel compound.

According to the invention, the comfort when sat on is substantially improved by the above polyurethane foam layer.

5 The drawing illustrates a number of embodiments of the invention which are used as examples. In the drawing:

figure 1 shows, in cross section, a shaped body having a lower gel layer and an upper foam layer;

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figure 2 shows, in an illustration according to figure 1, a foam layer which enters with lower projections into expansion channels of the gel layer;

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figure 3 shows, in an illustration according to figure 2, a foam layer which laterally surrounds the gel layer and the lower projections of which extend as far as the bottom of the expansion channels; and

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figure 4 shows, in an illustration according to figure 2, a lower gel layer having expansion channels of different design.

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Figure 1 shows, in cross section, a shaped body which is used, in particular, as a seat cushion and has a lower, supporting gel layer 2 which forms a lower covering surface 1, consists of a polyurethane gel and, on its upper side, has integral supports 3 which are spaced apart from one another via expansion channels 4 and on which a polyurethane foam layer 6 rests, the upper side 5 of which layer is covered by an upper covering 7.

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In the modified embodiment illustrated in figure 2, the polyurethane foam layer 6 has, on its lower side, integral projections 6a which enter into the expansion channels 4 of the gel layer 2.

In the embodiment according to figure 3, the integral projections 6a of the polyurethane foam layer 6 extend as far as the bottom 8 of the expansion channels and can be supported on the latter. Furthermore, figure 3
5 shows that the polyurethane foam layer 6 laterally completely surrounds the gel layer 2.

Figure 4 shows a further modified embodiment which to a certain extent constitutes a combination of the
10 embodiments according to figures 1 and 3. This is because in this case, on the one hand, expansion channels 4 are provided which are free of lower projections of the polyurethane foam layer 6, but enter with integral projections 6a into expansion channels of
15 smaller depth and smaller cross section, it being possible for these projections 6a to be supported on the bottom 8 of the expansion channels.

The gel layer 2, after a film produced together with it
20 has been pulled off, can be bonded to the polyurethane foam layer 6. As an alternative, the polyurethane foam layer could also be bonded to the supports of the gel layer by an applied adhesive.

25 In all of the embodiments, the upper covering 7 is a spacer knit which consists of two spacer textile surfaces connected to each other by spacer threads.

The essential advantages of the shaped body according
30 to the invention are to be found in the increased seating comfort with reduced overall height, the favorable ventilation properties, the good distribution of pressure, a soft behavior when sat on and in the reduced weight in comparison with a pure gel seat.